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The Scope of Statistical Method

By VALMORE GRATTON, B.A., L.Sc.C.
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(Before Montreal Chapter, March 7, 1929.)

MODERN developments have created such conditions that could not even have been thought of twenty years ago. By gradual steps, the material organization of the world has experienced an effective evolution from obsolete practices to adequate systems, consistent with change from personal leadership to large consolidation of capital. Because of this transformation, it has been found necessary to remodel the fabric of the entire business organization to suit modified conceptions. Among other important features, mass production, made possible through the introduction of improved machinery and labour saving devices, has greatly widened the scope of general activities. New problems, linked with these successful achievements of our age, chiefly since the post-war readjustment, have resulted in intensified competition. The fight for supremacy in industrial, commercial and financial fields is between gigantic forces which overshadow the so-called magnates of the past.

How business methods are associated with the idea of progress is demonstrated by current facts and also by statements of prominent men who have studied the intricate technique of modern undertakings. The function of scientific facts for the advancement of economic life is extended to almost every phase of production as evidenced by the wonderful showing of concerns converted to improved equipment and proficient management. The contribution of scientific methods has been marked by increased operating efficiency. In accordance with the requirements of standardized industry human skill has been tested under specific conditions and developed to its ultimate capacity. Careful consideration has been given by specialists to this question of reaching the maximum yield that could be attained with less effort by a man or a woman working under pressure. Everybody in this community has heard of the remarkable theories promoted by the famous American engineer, F. W. Taylor, and has read about the classical examples of that subject.

Careful Planning Necessary

In actual efficient business performance nothing can be left indefinite and guess work must give way to well-laid plans because new factors have brought the weight of their influence to the upbuilding of an economic structure based on specialization. Ours being a civilization ruled by an intense need for still greater practical achievements than those recorded so far we require improved mediums to ensure accurate results. Technical improvements, it is true, have curtailed the need for initiative on the part of the process employee who feeds a machine or operates a mechanical appliance, but on the other hand, owing to the wide diversity of operations involved in

modern business, better qualifications are now required for co-ordinating purposes. The official who supervises the system is left with various problems to master. Out of these difficulties arising from the erratic progress of industry is born a new theory of management in pace with the most advanced principles of modern science. I venture to say that efficiency in business could not be maintained to its actual degree of perfection without the aid of these scientific methods. As the laboratory has contributed solutions to many industrial problems of the day, just so have statistics been important factors in building up sound business systems with maximum efficiency and avoided costly mistakes.

Statistical Methods

The idea that statistical methods are getting to be prominent requisites of business is supported by daily observations and periodical reports issued by the most progressive institutions of this continent. From a simple process of enumeration conducted for the benefit of State organization they have developed to be fundamental of efficiency dependent on permanent laws which may often be neglected or misused but which cannot be overlooked. These laws are derived from the critical analysis of past events serving as guides for the interpreting of present conditions or forecasting of future possibilities. A close study of the mutual relation of facts leads invariably to the discovery of their natural sequences. Of course, isolated facts must never form a basis for general deductions, frequency of observations being the only safe confirmation of accuracy when dealing with estimates.

According to Professor Karl Pearson, of University College, London, "the scientific method is marked by the following features:

" (a) Careful and accurate classification of facts and observation
" of their correlation and sequence;

" (b) the discovery of scientific laws by aid of the creative im-
" agination;

" (c) self-criticism and the final touch-stone of equal validity for
" all normally constituted minds.

From this statement the thought deserves special attention which relates to judgments resting upon statistical findings. They should appear as being true to every individual which implies that work has to be done by experts indulged with a scientific habit of mind. When comparing a stated numerical unit with some other fact it is important that all features be properly weighed in accordance with rules formulated by experience. The application of psychological principles, that is, of laws involving interpretation based on personal feelings, is difficult in itself because it requires scientific knowledge lacking to the average student of economic conditions.

Why statistics often fail to be credited as worthy of attention on the strength that contradictory conclusions may be drawn from the same data is easy to understand, but lack of technical ability in the treatment of numerical phenomena should not reflect on the whole method any more than a misprint should prejudice us against printing. But leaving aside all construed opinion misrepresenting the subject, I

wish to briefly summarize a method common to all statistical investigations. They comprise three distinct phases: COLLECTING, CLASSIFYING and INTERPRETING.

What to Collect

The first point to be considered in every inquiry is to have a well defined plan of what is intended to be tabulated. A solid foundation is required for a local market survey as well as for a broad industrial census. Preliminary to the execution of the work a schedule must be set forth showing what approximate result is expected to be derived. Sometimes it is advisable to make a trial test in order to have all the necessary material available for establishing a fairly close estimation. After the desired information is carefully determined the next move consists of rushing the field force into action.

The process of collecting the information is generally carried out through issue of blank forms forwarded with a circular explaining clearly what is wanted. The desired information must be assigned a certain limit of time, space or quantity according to type of survey. At the same time the question must be presented so to avoid all possible misunderstanding and resolved into a simple answer such as a number or a word. Care must be exercised not to conduct the investigation in a way that would appear inquistorial and the questionnaire should not ask for more than is really needed for the purpose. Further, terms must be explained whenever a word is liable to be interpreted various ways. Take "profits" for instance; unless they are calculated on the same basis no uniformity will ensue and therefore no comparison will be possible between the various figures obtained.

Classification

After the information is compiled and segregated, it has to be classified under units of similar character, before it can be of service. The method used varies widely according to material involved and scope of query. In the case of a nation wide census sorting and computing is done by aid of automatic machines, but whether the data is assembled mechanically or by a staff of clerks the figures have to be checked as to correctness of calculations. It is also essential that the statistical tables be made attractive and comprehensive to the man on the street or else the result is impaired on account of the natural reluctance on the part of the average observer for any idea expressed with numerals.

Interpretation

Statistical units do not have any significance unless they are compared with some other variables to which they bear relationship. This task of measuring complex phenomena should be left with qualified specialists who combine practical experience with theoretical knowledge. More than usual ability is required for interpreting statistics because so many factors must be taken into consideration, many of which escape the inexperienced observer.

These pointers only give a faint idea of the difficulties connected with the practice of statistics. Yet if we stop to think of the wide application assigned to statistical methods we soon realize that no

credible statement whatever can logically be ascertained which is not supported on some numerical facts. When studying the reaction of events again we have to appeal to statistics, through which the field of individual experience is greatly enlarged. What could a man do if he was dependent merely on facts that he can visualize in the very narrow field of his personal activity?

It must be remembered, however, that statistics only deal with estimates and can never attain mathematical exactness. Being compiled with the help of organized bodies of workers, they are subjected to various types of errors, the effect of which can largely be compensated by the use of technical methods based on the property of numbers, but, such as they are, with all their limitations they are essential in any branch of activity, namely, in commerce, industry and finance. In these fields eagerness of competition has compelled live business men to comply with unfailing standards as a means for retaining the old clients and conquering new markets. Assuming that profit seeking is the aim of all exertion having in view a commercial purpose, there is no possible way of escaping the rigid law of elimination unless assistance is secured from skillful accountants, statisticians and advertising experts for restricting waste, curtailing unproductive expenses and reducing cost. Hence research is tied up with large scale production, marketing and geographical distribution of goods. The industrial magnate, if abreast of the times, must be aware of the needs and taste of the consuming public to fully anticipate the demand without exceeding it; he wants to keep his plant at full operating capacity to avoid ruining overhead charges; he needs to be alert to fight cut-rate competitors, prevent over-production, protect his credit and take care of the shareholders' interest. He must necessarily rely upon experienced advisers and clerical force for successfully achieving this task of building sound business on efficiency, service and high prestige.

Cost of the Service

Cost of maintaining a statistical service is an investment, not a loss nor a gamble. It is queer, though, how so many executives who would sometimes spend their energy and wealth in business ventures hesitate when it comes to giving financial support toward promoting efficient systems. Our country as a whole is far from being sold on the idea of applying scientific methods to serve economic progress. Canada, in this respect, stands far behind the United States, which points the way to every nation for daring ambition and renovation of practical routines. And yet we allow our powerful competitors to spread over the country, dominate our industry and we think we will get away with it in the end. This peaceful but steady penetration of American capital, goods and literature will have far-reaching effects if not opposed with a progressive internal scientific organization based on co-operation. I had the privilege of studying the methods used by private institutions and state organizations in various leading cities of the United States and can say that no business force can fight with fair chances of success against this penetration without similar systems or methods.

The Dominion Income Tax

By C. S. WALTERS
Commissioner of Income Tax

(Before Montreal Chapter's Annual Dinner, April 11, 1929, as reported in "The Montreal Star")

ALTHOUGH no one system of taxation can assure equal justice to every class of taxpayer, the income tax is a valuable method in that it helps to place the burden where it can best be borne, in the opinion of C. S. Walters, income tax commissioner of Ottawa, who delivered an address at the annual banquet of the Montreal Chapter, Canadian Society of Cost Accountants. Mr. Walters replied to many of the criticisms levelled against the income tax and concluded that capital was not driven out of the country, that the cost of collection was not as excessively large as sometimes charged and that officials of the tax department had not been turned into an army of spies and secret service men with the purpose of ferreting out the private affairs of taxpayers.

In his opening remarks, Mr. Walters recalled that as a result of the world war, the government was faced with a greatly increased task of providing revenues for governmental purposes such as had never been encountered before. To raise revenues, governments have three main methods, namely, from state-owned property, from commercial enterprises such as railways and post offices and from the proceeds of loans.

Taxation has somewhere been defined as the compulsory exaction on the part of the state of part of the wealth of the individual for public purposes, he said. Such exaction naturally reduces the power of the individual to save, spend and invest but the collective spending by the nation made up for the loss of spending power to the individual.

Many countries of the world are now discarding old system of taxation and turning to the income tax, continued the speaker, as a more equitable means of placing the burden upon the shoulders of those most able to pay. Various forms of taxation have been tried such as the poll tax, the property tax, the expenditure tax, the tax on products and lastly the income tax. At the present time, he declared, the income tax has found a permanent place in the fiscal schemes of more than 50 countries of the world.

How Started in Canada

In Canada the income tax was born of the Great War. "It is not my job to say whether or not the exemptions are too high or too low; it is my job to administer the law," the speaker continued. "During the years in which the Income Tax Act has been in force the office at Montreal has collected $165,000,000. This statement may answer some of the criticisms that the tax is not susceptible of collection."

Referring to criticism of the income tax, Mr. Walters said that although in some cases Montreal papers had condemned the method as unsound, at the same time they had given every support to the admin-

istration in collecting the impost. For this support he expressed the appreciation of the department.

"I have heard it said by proponents that the income tax is the fairest system that can possibly be devised," added the speaker. "I do not agree with that opinion. The income tax with other systems is an admirable means of raising revenue and is valuable because it helps to place the burden where it can best be borne. At least it is a compensatory measure to persons in the lower economic categories. I do not think we can raise all revenues by the income tax; in a country of such wide extent as ours, I do not think that any system can assure absolute justice to every class of citizens."

Mr. Walters then replied to critcism frequently heard against the income tax. It has been said that the tax tends to drive capital out of the country. It is a fact, he said, that foreigners can come to this country, establish themselves, and invest their savings in Canadian stocks, from the dividends of which not a cent will go to the government in taxes.

Far from capital being driven out, the figures of foreign investments in Canada showed that in the past few years there was a steady increase. In the year 1923 foreign capital invested in Canada amounted to $2,417,000,000; in 1923 it totalled $4,817,000,000; at the beginning of 1929 it amounted to $5,707,000,000, and to-day it would be well over the six billion mark as believed.

Low Collection Costs

A second criticism was that the tax could not be collected. In this connection he referred to a statement that the government had spent $300 in collecting a tax of $100, but denied any official information of such a case. Last year the income tax in the whole of Canada yielded a revenue of $59,422,000, and cost $2,200,000 to collect, leaving a net revenue of upwards of $57,000,000. Since 1917 total collections of the tax amounted to $544,000,000, and the cost amounted to approximately 4 per cent.

It is also charged by opponents of the tax that the private business of individuals is pried into and the opinion voiced that no government had a right to inquire into secret matters which concern only the citizen himself. As to this criticism, the same complaint might be laid against other forms of taxation as, for instance, the customs tax, he said. In any case, there need be no cause for apprehension that the private business of the individual would become public property, as all officials of the department are sworn to secrecy, and the penalties for breach of confidence are severe.

Another complaint laid was that the department officials had been turned into spies and secret service men. "During all the time that the income tax had been in effect in this country, on no single occasion has the department paid one dollar to an informer nor has it made spies and spotters of its officials," he declared. "On no occasion either has the department prosecuted on information contained in anonymous letters, on information supplied by disgruntled or discharged employees, or on information given by an enemy or other person acting from motives of spite."

COST LITERATURE

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THE TREND OF PRODUCTION COSTS

GENERAL price levels showed little change in June, nor in fact has there been any other recent change of importance as affecting production costs. The following are price index numbers as compiled by the Dominion Bureau of Statistics:

	June 1928	May 1929	June 1929
Total index all commodities	96.4	92.4	92.6
Consumers' Goods	95.7	93.3	93.4
Producers' Goods	96.6	93.1	93.3
Main groups of commodities:			
Vegetable products	93.0	81.7	82.4
Animals and products	108.5	108.6	108.2
Fibres, textiles, etc.	94.3	91.8	91.6
Wood, wood products and paper	98.7	94.1	94.3
Iron and its products	93.2	94.1	93.9
Non-ferrous metals	89.9	95.2	94.8
Non-metallic minerals	92.5	92.3	92.9
Chemicals	95.3	95.4	95.5

These figures are percentages of average prices for 1926.

Costing in the British Army

By A. BAILEY

Northern Electric Company, Ltd., Montreal

(Before Montreal Chapter, December 6, 1928)

IT is not my intention to bore you with a lot of detail work and so I have eliminated a great deal and have confined myself chiefly to an endeavour to make a short story of "My Experience of Costing in the British Army," which I sincerely hope you will find interesting.

I would also like to explain that the title heading of this paper really refers to the period of December, 1918, to October, 1925, and *not* the system prevailing to-day. It was my error, but time flies so rapidly. I have just begun to realize that I have been in this great country nearly two years.

To begin with my personal experience in the British Army, in the capacity of Cost Accountant at any rate, was a mixture of hard work and humour.

At the latter end of 1918 I was recalled by the War Office from the regiment I was then stationed with and invited to become a pioneer in the inauguration of the new System of Cost Accounting, about to be introduced into the service, under the leadership of Col. Grimwood, C.A., who was, before the war, practising in London, England.

One hundred men of all ranks were collected from various regiments, and we all gathered daily in the War Office for a series of lectures from the worthy colonel and other distinguished accountants—this lasting for about three weeks, when we were distributed to all parts of the United Kingdom to work out our own salvation.

Gradual Changes

We had embarked on a great undertaking (I say great undertaking) because, to introduce an entirely new system of bookkeeping of any kind into such a widely scattered organization as the British army was a gigantic task, more especially at this period, when hundreds of thousands of men were awaiting demobilization. One can well imagine a huge business with hundreds of branch houses scattered all over the world introducing a new system of bookkeeping. The old system, however, was not to be ruthlessly scrapped, but the new costing system was to be gradually merged into the existing one, and, as the work progressed parts of the old system were either dropped altogether or greatly improved upon. This needed the co-operation of all departments (sometimes we got it and sometimes we did *not*). However, rapid strides were made in bringing the costing system up to a very good standard and where, in the beginning, two or three men were working together on *one* account, after about two years five or six accounts could be maintained very efficiently by one unit accountant. By the end of 1922 the system was more or less standardized,

and we had heaps of spare time. Of course, improvements were always being discovered and at the beginning of each successive account period these improvements were brought into operation. We all know there is always *something* to learn in costing.

Here I would just like to point out that the army of *any* nation is purely a huge spending department (a very one-sided account), the cash receipts apart from the public's money, being practically nil. The only sources of incoming cash resulting from the "sale of manure," usually contracted for at approximately 4 cents per horse per week by various or sundry nurserymen, unconsumed food (or swill), also contracted for by farmers for their piggeries, the sale of clothing to the soldiers themselves, and perhaps a small amount deducted from men's pay under the illusive term of "barrack damages"—but if some of the men concerned were here now and heard me say *small* amount they would probably disagree.

Well, now, I was posted to one of the largest military hospitals, the Royal Herbert Hospital, Woolwich, the accounts of which I found most interesting. When I first arrived there I got rather a hostile reception, as the quartermaster and others in authority rather resented any interference from individuals about to open up new forms of accounts. The system then in vogue was very much cherished by the quartermasters (one seldom met with a *thin* quartermaster), some of you, no doubt would have an idea of the reasons. We were looked upon with a certain amount of suspicion by these gentry. Some even declared that costing was no good before we commenced. This was not at all encouraging but we knew we had a great many obstacles to overcome and so set to work with a will.

Stocktaking Came First

My first job was to take stock, and I was well occupied for over a month on stocktaking alone, prior to drawing up a "statement of affairs," but with the help of the men in the various departments concerned and a little diplomatic persuasion the quantities and prices were forthcoming in the daytime, but I usually made the extensions in the evenings. I found I had several accounts to compile, among which were the following:—7 maintenance accounts, comprising sisters, a detachment of V.A.D's., nurses, a company of the Royal Army Medical Corps, a detachment of W.A.A.C.'s, army doctors and civilian doctors, two working expense accounts of automobiles and motor ambulances, two production accounts, tailors and shoemakers' shops.

Each of these were separate accounts and carried their own personal accounts, stock accounts and balance sheets were also required for each. You will readily agree that this was no easy job. One other man and myself were detailed for this job, and I think it would be somewhere around August, 1919, when we submitted the first batch of accounts, applicable to the above mentioned, for the month of January preceding.

The clothing and equipment stocks were split into two—"clothing and equipment in store" and "clothing and equipment in wear" for purposes of depreciation, a suit of clothes was given a life of one year and a great coat or British warm, a life of three years (a month ago

it was brought up at the regular meeting here regarding the difficulty of determining the life of machinery, and this just reminds me that when I handed in my British warm, although to all intents and purposes it was supposed to be worn out four years previously. However, as there were no instructions available at that time to arrive at the valuation of "clothing in wear" it was rather difficult to get at the stock figure, but it was managed this way with a fair degree of accuracy—Supposing there were ten huts, each accommodating 30 R.A.M.C. men, we got all the men of one hut on parade with their kits laid out as for inspection, and valued each article belonging to every man in the hut on a percentage basis, "new clothing" of course, being at full value, "part worn" at 50%, and "old" but still serviceable at 25%. We then struck an average for the full complement of the R.A.M.C. company. There was a certain amount of humour in this, and I remember asking one man what he used his toothbrush for (seeing it was very dirty looking), and he replied—"To clean my buttons with." I then enquired what he used for his teeth, and he said the "one brush did the two jobs."

Getting Information

To revert to the maintenance accounts for awhile—most of the information required to make up the accounts was obtainable from the quartermaster's office, but it generally needed some gentle pressure to gain possession of this.

I must mention the awkward situation I once found myself in, in reference to getting to learn the officers' pay and allowances (later on there was a full list supplied by the command paymaster of rates of pay, etc., of officers according to rank), but at this early stage of costing there was no alternative but to go and ask, and so I boldly entered the colonel's den, and respectfully asked how much a month he was drawing (I thought there was nothing like starting at the top). Well! of course, he was anything but polite, but when he also said the new corps was no good (or words to that effect)—that was rather too much for me, and I could not refrain from reminding him that I was not there to discuss the merits of the corps, but merely to obtain all the information I possibly could in order to compile the necessary accounts required by the War Office. It was only natural he should resent the question, but after that we were good friends, and all subsequent information I asked for he saw to it that I obtained it.

Maintenance Accounts

Now there was really nothing new regarding these maintenance accounts, just simply recording the expenses going towards the upkeep of the establishment, much the same way as a commercial business house, with the exception perhaps that some of the items in the army would not occur in outside business, such as the consumption of provisions, but a book was already in use for this purpose called AB10, and it was just a case of extracting the details, and of course keeping a close check up on the extensions, etc. Clothing, free issues for recruits, were dealt with in much the same way, the totals being extracted at the end of account periods and journalized. The item of

rent was based on the assessed valuation, being split up into the various accounts in proportion to floor space occupied by the several departments. Latterly the divisional officer of Royal Engineers, who dealt with all government and hired property, supplied the figures. the receiving unit accountant passing a journal entry, debiting maintenance account direct and crediting the personal account of the divisional office, Royal Engineers. The telephone expenses, I understood, prior to costing, were never recorded. The Postmaster-General could apparently send in his invoice for any amount, and, well—just get paid. But when costing commenced the procedure of keeping account of all local and trunk calls was adopted, and each month were systematically checked up on receipt of the P.M.G's. bill.

These are just a few items picked out at random, as the remaining items were put together in a similar manner. After having procured all the figures going to make up a specific maintenance account, it was necessary to fix a unit cost, which in this case was to be the "cost per head per day," and some "wit" added the word "perhaps." However, this was easily arrived at by taking the total number of personnel of the department concerned. As an example we will say this particular account was for the R.A. Medical Corps Company and they were 100 strong. By multiplying the strength of the company by the number of working days in the month we got the total number of men-days. This formed the divisor into each main heading or item, such as pay, provisions, rent, etc., etc., and then the total of the account divided by this figure would thus give the "cost per head per day." The idea of dividing each heading was to help the administrator to make comparisons month by month. This procedure was most beneficial insofar as a check was constantly kept of each item, and as each succeeding month's accounts were produced the administrator could pounce on any abnormal differences, and any particular item singled out was brought to the notice of the commanding officer, who would at once make investigations.

I will just mention one or two examples where economy was effected in the first few months of this system. They would appear ludicrous were it not for the fact that the same thing presumably was happening all over the country. Strict economy was the order of the day and still is. First, on taking the issues of drugs and medicines I discovered that only about 75% were duly recorded as compared with the stocks remaining. After enquiries it was found that men of all ranks would wander round to the side door of the dispensary and prevail on the good nature of the dispenser on duty to part with bottles of medicines, pills, etc., probably for a trifling consideration. Now, this was not permitted, and was immediately stopped.

Leakages Discovered

Another example was that five sisters were living in a house hired by the government just outside the hospital. These sisters had just to prepare their own breakfast each day, which necessitated lighting a fire (the rest of their meals were obtained inside the hospital). Well, in order to light the fire these good ladies were supplied with a gross box of matches each month by just filling in a requisition form. Dear knows what they did with them, but suffice it to say that their

supply was rigidly cut down to about 6 boxes a month. There is just one other example I would like to mention here. I could not help noticing the vast army of cleaners and scrubbers, and so I concentrated on this department for a few days. After preparing the account I found that the quantity of beeswax issued was really out of all proportion, although it takes quite a lot to keep the floors of a large hospital polished, but if I remember rightly the issued was reduced from about one cwt. monthly to something under a quarter of a cwt. The account also showed that there were twice the number of cleaners actually required, the work done proved to a few square yards per head daily. This was also brought to the notice of the commanding officer and in a short time a big change took place. Now, gentlemen, these and sundry leakages were constantly being shown up in the accounts all over the country, and I think a great service was being rendered to the public. Certainly the officers commanding the various regiments forgot their early remarks that "the costing system was more or less useless, and the same gentlemen were beginning to take a little interest in the work turned out, and were not long in declaring that there was something in costing after all. Had it not been for the costing system these leakages would probably have continued indefinitely. These incidents are merely quoted in an endeavour to strengthen the claims of cost accountants generally as a useful body of workers, and I think the introduction of costing into any business spells progression.

Working Expenses Accounts

There is little to say regarding the working expenses accounts, it was simply a case of collecting the items and statistical data, and fixing the unit cost, which was, I think, in the case of transport motors "cost per mile," and in the case of motor ambulances "cost per patient carried." The unit costs of the production accounts were, for the tailor, cost per suit repaired (of course a soldier was only blessed with a tunic and pair of trousers for a suit), and if the tailor should happen to repair 12 pairs of trousers, for the purposes of costing they would be reckoned as six suits. The shoemaker's unit of cost was "per pair of boots soled and heeled."

The stock accounts were dealt with in much the same way as in commercial life, with one or two exceptions such as clothing, as before mentioned, which was divided into two stock heads, viz:—Clothing in Stock and Clothing in Wear, the reason being that the authorities did not think it worth while depreciating on clothing in stock, but the other army "of rats" did not bother very much about this decision, they just went ahead. However, the War Office thought perhaps the depreciation here was too small to worry about. Taken all round, I think the stock of "clothing in wear" was about 50% of the new value. Depreciation was charged on equipment in wear, also on all other stocks where necessary.

The provision stocks entailed rather a lot of work, not that the soldier lived luxuriously, but it really is surprising the number of different commodities involved going to make up even plain meals, adjustments having to be made of stocks remaining to bring them up to the market values at the end of each period.

Special Items

Reverting to the maintenance accounts for a moment, it often happened that an establishment like the Royal Army Service Corps would require extra men temporarily—these men were loaned from an infantry regiment or some other local unit, and in order to keep as near to the true cost of a regiment as possible, the unit accountant of the lending regiment would send a debit note (or invoice) to the receiving unit accountant, charging him with services rendered at fixed schedule rates according to ranks—presuming these men were single the rates would be 9/- per day for a sergeant, 7/- per day for a private and so on. This procedure was followed also when men were sent on special courses of musketry or gymnastics, etc. When the receiving unit accountant got the debit note he immediately passed a journal entry; he also detached a slip from the debit note, filled in the amount he had accepted, and returned the slip to the issuing unit accountant, who likewise checked up the amount accepted. This idea facilitated the agreement of balances between units at the end of each account period. And so a complete understanding existed between all the scattered unit accountants. Much the same way as the branch houses of a business would all understand the system adopted by the parent unit or head office. But in the service these are just paper transactions, cash never passing from one unit to another.

To-day, or rather the day I came away, the system was very much improved, and I must say there were very few loopholes left for wastage; everything that is possible is converted into cash, even waste paper, boxes, and all other scraps of lumber and metals which hitherto were simply dumped on the nearest incinerator, are now sold to various contractors. The system, too has been extended to all parts of the world, at least to very part where British troops are stationed, with the exception of India, as British troops in India are maintained solely by the Indian Government and paid by them, and not by the British Government, but the Indian service has also its own system of costing.

Merging Accounts

All debit and credit balances outstanding on each unit accountant's books are systematically agreed before the final accounts are prepared, before each unit accountant submits his accounts at the end of a period, which when I left was quarterly. The accounts are then co-ordinated in the same command under each arm of the service. For instance, supposing the Scottish command had 30 infantry regiments, 6 cavalry, 10 batteries of artillery, 5 hospitals, etc., etc. All these accounts are collected and co-ordinated, the thirty accounts belonging to the infantry would thus be merged and made into one account. The command accountant would thus send one balance sheet for infantry, one for cavalry, etc., to the War Office. This would take place in every command both in Britain and overseas. The staff at the War Office would then get busy and co-ordinate the accounts from each command accountant and so finally the one balance sheet would be completed. From start to finish this operation would take from one month to six weeks after the closing of the unit accountants' books.

I have since heard the shore establishment at least of the Royal Navy have also taken up a system of costing. But what I would like to point out is this, that when a vote for any expenditure for the following year is put through Parliament, the annual estimate is now, thanks to costing, always very close to the actual amount required, and, therefore, it is known exactly how the money is to be spent. Previous to the introduction of the costing system into the army, numerous supplementary estimates had to be passed, and I feel quite sure that the general public, and very often the statesmen themselves, had not the remotest idea of how a good portion of the money so voted was being disbursed.

This in itself, I think, would commend the new corps to the general public, and would at least help to lessen the burden of the overtaxed ratepayer, who is very sadly in need of a little assistance in this direction.

SOCIETY'S PRESIDENT TOURS WEST

PROF. R. R. THOMPSON, president of the Canadian Society of Cost Accountants, is now completing a tour of the west, in the course of which he was scheduled to address a luncheon meeting of the Calgary Chartered Accountants' Club at the Palliser Hotel on July 26 and a dinner-meeting of Winnipeg Chapter of our Society at the Royal Alexandra Hotel on August 9.

CANADIANS AT N.A.C.A. CONVENTION

S. E. LEBROCQ, vice-president of the Canadian Society of Cost Accountants, and comptroller of the Steel Company of Canada, Hamilton, and E. E. Hill, also a member of the Canadian Society, with the Canadian National Carbon Company, Ltd., Toronto, were present at the tenth annual convention of the National Association of Cost Accountants in West Baden Springs, Indiana, June 17-20.

MEMBERS GOING TO ACCOUNTANTS' CONGRESS

SEVERAL members of our Society have expressed their intention of attending the International Congress on Accounting which is to be held in New York City, beginning September 9. These are James Turner, C.A., past president of our Society, of the T. Eaton Company, Ltd., Toronto; H. E. Guilfoyle, C.A., vice-president of our Society, of Clarkson, Gordon, Dilworth, Guilfoyle and Nash, Toronto; and J. E. Carpenter, of De Forest Crosley Radio Company, Ltd., Toronto.

Cost Finding in a Confectionery Manufacturing Plant

By THOMAS HOOD

Comptroller and Secretary-Treasurer, Moirs, Ltd., Halifax

(Before the annual meeting of the Institute of Chartered Accountants of Nova Scotia, April 23, 1929)

(From the "Canadian Chartered Accountant")

A COST System for a Confectionery Plant, if it is to be practical and give reasonably accurate results, offers many problems for the Cost Accountant.

The installation of an up-to-date general accounting and cost system for the candy factory is necessarily complicated by reason of the many and varied products manufactured, and by the fact that some plants manufacture all the chocolate coatings they use direct from the cocoa beans, and also often sell these coatings as finished product to other manufacturers. Some plants also manufacture all the paper boxes used for the packing of candy, and, in addition, sell paper boxes as finished product.

This means that it is necessary to know the actual cost of these various so-called process materials (coating, paper boxes, etc.), not only for the costing of the finished candy, but also for the cost of sales of any of these process materials which are sold outside.

General Accounts

Before going into the details of the cost system, perhaps it would be as well if I referred briefly to the necessary general view accounting system for the tying in of the cost system. This should comprise the following ledgers and books of record:—

A General Ledger.

An operating Ledger, containing the operating accounts of the various process and finished stock plants for the manufacture of confectionery products; also the operating accounts of the various service departments.

This operating ledger should contain all the necessary accounts for the preparation of a monthly operating statement for each department of the business.

Accounts Receivable Ledgers, containing the customers' accounts in the sales territories into which sales are divided.

A miscellaneous ledger, for sundry accounts receivable and accounts payable (other than trade accounts), personal accounts, etc.

A cash book, voucher, journal, sales recap. journal, stores distribution summary, pay roll register, process production record, finished stock production record, stores perpetual inventory record and finished stock perpetual inventory record.

There should be a system of account numbers for the general ledger and for the factory operating ledger. The accounts in the accounts receivable or customers' ledgers and in the miscellaneous ledger are, of course, arranged alphabetically. Customers' ledgers can be machine posted and the ledger sheets carried in trays.

The audited voucher system should be used for accounts payable trade. This system does away with the purchase ledger.

The general ledger accounts should be arranged in order of the balance sheet, the following tabs being used for index purposes:—

Under assets:—

Cash, accounts and bills receivable, inventories, deferred charges, investments and properties.

Under liabilities:—

Loans, accounts payable, accrued liabilities, bonds, etc.

Under reserves:—

Various depreciation and other reserves.

Under surplus and capital:—

Sales and other revenue accounts, expense accounts, profit and loss account, surplus account and capital stock.

Behind each of these tabs there is an index, in numerical order, for the accounts and account numbers which come under the particular classification as indicated by the tab.

The Operating Ledger

The accounts in the operating ledger are arranged in the order of the operating statements, with tabs for departments, materials, wages, etc., so that the taking off of a trial balance of these ledgers simply means filling in the operating statements. The operating ledger is controlled by an account which appears under the inventories tab in the general ledger called "Operating Ledger Control Account." The operating ledger will contain the necessary accounts to record the operations in detail of the various manufacturing and service departments. There is a method of combining department numbers with operating account numbers so that the index for this ledger need not be a large one.

The operating accounts of the manufacturing and service departments, as carried in the operating ledger, should be divided, for bookkeeping and cost purposes, as follows:—

Departments Manufacturing Process Materials

Such as the chocolate plant and the paper box factory,

Departments manufacturing Finished Stock,

Main candy plant, etc.

Engineering and Service Departments,

Carpenter, electrical, machine and paint shops, various power plants, garage, stables and warehouse accounts.

An operating statement should be made out for each of these departments each month.

Divisions of Candy Plant

The main candy plant can be further divided into departments as follows:—

Hard candy room.
Starch room.
Pan room.
Bon-bon room.
Chocolate dipping room.
Moulding room.
Enrober room.
Mixture room.
Fancy package room.
Finished stock room.

The starch room will make centres for the panroom, chocolate dipping, moulding and enrober rooms. The hard candy room also will make centres for the chocolate dipping, moulding and enrober rooms, but in addition will make numerous lines of finished hard candy which are packed in that department as a finished product. The same may apply to other rooms.

In the chocolate dipping room the centres are coated with chocolate by hand. Some of these chocolates are packed in this department as finished goods, others go to the fancy package room to be packed into fancy packages. The moulding room turns out finished bars and moulded chocolate. The enrober room coats centres and bars with chocolate by machinery. Part of this production is packed in the department, and part goes to the fancy package room for packing into mixtures with bon bons and various lines from other departments.

Preparation of Monthly Statement

For the preparation of a monthly balance sheet and profit and loss statement which will record as accurately as possible the results of the month and of the year to date it is necessary to price the different lines of production from each of the various departments. This means a cost price list for raw materials, process materials and finished stock. As each department has its own operating statement drawn up to show either a surplus or deficit on operation, it will be apparent to you that the unit costs on which the cost price list is based must be carefully and accurately prepared in order that the surplus or deficit shall be small. To avoid frequent changes in the cost prices, I suggest the use of what are known as standard prices, that is to say, to establish prices, in the first instance, for all raw materials, these prices being estimated as being the average cost of the purchases of the material for, say, six months or a year ahead. This is necessary for the reason that market prices of the principal materials, cocoa beans, cocoa butter, sugar, etc., are constantly changing. If an average standard price were not used, it would mean the changing of the prices of materials charged into the factory, and also the continual changing of the unit cost sheets of the lines manufactured. The price of sugar, as you know, is continually fluctuating up and down, and sugar is used in every line of candy manufactured. For a rise of ½c per pound we would have to change the unit cost of perhaps 500 lines. A

drop of ½c per pound the following month would mean the same figuring all over again.

The method of avoiding all this figuring is as follows:—

In the stores ledger (perpetual stores inventory) carry a separate account for each class and grade of material used. On the debit side of the stores ledger account record the actual cost value (including freight and duty) and the unit cost of each purchase. From this record the average unit cost of all the purchases of any one material can be quickly figured. The credit or consumption side of the stores ledger sheet records the charging out of the various quantities of the material to the factory at the standard price. This standard price, which should be made up in December each year to be used for bookkeeping and cost purposes during the following year (unless some very great fluctuation in price takes place), is the average cost of the material for the past year as obtained from the debit side of the stores ledger, or the current market price, whichever is the lower, combined with the estimated cost of the material for the next twelve months. If necessary, add a small fraction to make the price even for figuring.

In December, when establishing the standard prices of materials for the following year, re-price all materials at cost or market, whichever is the lower, and the resultant surplus or deficit in the stores ledger (from the operation of this system for the past year) is carried into an account called inventory adjustment account. This inventory adjustment account is also used for the writing off of any stores spoiled during the year or for any other differences which may occur in the operation of a perpetual book inventory. This inventory adjustment account should not be taken into the operating statements but shown separately in the profit and loss account.

It is clear that, if fairly accurate standard cost prices for raw materials can be established, standard cost prices for the various process materials and for finished stock can be readily figured. These prices, called unit costs, are prepared on what are known as unit cost sheets. The unit cost sheet should show the same general headings as the operating statement. The unit cost sheet should also show separately the cost of each department through which the goods have to pass before they are finally finished, ready for shipment.

The Unit Cost Sheet

I now propose to describe to you the preparation of a unit cost sheet for a hard centre chocolate, produced in bulk.

This chocolate is made up of a centre and a coating. The chocolates are to be packed in a paper box and later into a wooden box for shipment. The centre for this particular line is made in the hard candy room. The materials are, of course, covered by a formula. Add to the cost of the materials a percentage for wastage. This figure has been determined from tests made, and takes care of mistakes in weighing, the loss of any part of the batch which slops over the sides of the cooking kettles and similar wastage. To this total cost of material add the manufacturing labour in the hard candy room. This labour is on a poundage basis, and is arrived at by taking the total poundage made in the room and dividing it into the total labour. Add departmental overhead, which is that portion of the overhead of

the main candy plant chargeable to this department. The sum of these items is the cost of the batch of centres. We know from tests that we get a production of good finished centres of so many pounds, so many pounds of scrap, and that there is a cooking loss of so many pounds, the total equalling the total poundage of raw materials put into the batch. The good production divided into the total cost value gives the total cost per 100 pounds of centres.

These centres now go to the chocolate dipping room to be coated with chocolate. We, therefore, carry down the cost of the centres and add the number of pounds of chocolate coating which will be used to cost that number of pounds of centres. We again add a percentage for the wastage of chocolate. We add the manufacturing labour, which, in the dipping room, consists of two different kinds of labour: piece work, which is productive, and day work, which is non-productive. The non-productive labour is the wages paid to the inspectors and those who are supplying the chocolate and centres to the productive girls, who are dipping at piece work rates. To this total add the overhead in the department and arrive at a total cost of the dipped chocolates. Again we show the good production and the scrap. By dividing the good production into the total cost we establish a cost per 100 pounds of the finished dipped chocolates.

Now move into the packing department of the chocolate dipping room, as these chocolates have to be packed in five-pound boxes before they go to the finished stock room. To the cost of the dipped chocolates add the cost of the containers, consisting of the boxes, trays, stuffing paper, name cards, labels, etc. Again add a percentage for wastage to these paper box materials; add the packing labour, both piece work and non-productive, and the overhead. Dividing this total cost by the number of boxes produced, we arrive at the cost of a five-pound box of chocolates put up in bulk.

Now carry this cost down to the finished stock room and add the cost of packing these five-pound boxes into wooden boxes ready to be shipped out to the customer. This total is the factory cost, and this is the cost to be used for pricing the finished stock production and for inventory valuation.

Overhead and Its Distribution

Commercial overhead, consisting of shipping, selling, advertising, general administrative expense, bond interest, etc., is not apportioned to the operating departments, and is not included either in inventory values or in cost of sales, but charged direct to profit and loss. We have to know, however, the total cost of each line, including commercial overhead, for sales price purposes, so we now add the commercial overhead as a percentage on factory cost. This gives us the final finished cost of the five-pound box of chocolates. The difference between this final finished cost and the selling price is the net profit, after everything.

This brings me to the distribution of factory overhead and commercial overhead.

The candy business is a seasonal one. Sales for the last four months, September to December inclusive, are usually greater than those for the first eight months of the year, and the bulk of this last

four months' business is occasioned by the Christmas season. It is usually necessary to commence manufacturing ahead for the Christmas season early in August, which means the filling up of the finished stock room from August until October, when the goods start going out for delivery to customers. The distribution of the factory overhead of the main candy plant, therefore, must take account of this seasonal business, and a considerable unabsorbed burden will be built up during the first seven months of the year, this unabsorbed figure being gradually absorbed during the last five months, and completely wiped out at the end of the year. If this unabsorbed figure is to work out correctly, we must budget fairly accurately the sales for the year and the various items of overhead. This is done by careful estimates and the preparation in January each year of a budget for each department.

The same applies to commercial overhead. A budget is prepared of selling expense, shipping, advertising, general administrative expense, interest, etc., for the year; dividing this total by the total estimated sales, we arrive at a percentage to apply to the costs.

If these budgets were not prepared, the unit cost sheets could not be accurately made up.

Another problem is how to apply factory overhead to the various classes of candy manufactured.

Some manufacturers use a percentage on labour. While this works out fairly well in some departments, in others, which are practically all operated by machinery, the percentage is so high that any slight difference in wages will throw the costs all out of line. For example, in the starch room, where a few men operate machines turning out a very large poundage of goods, the percentage of factory overhead to labour was, in one plant, over 400%. You will see how even the change of a few dollars in labour per month would alter this percentage considerably.

Another method which has been used is to apply the factory overhead as a percentage on the sum of labour and material used. This will reduce the percentages in most departments to less than 100%. This method is, I think, unfair, for the reason that you penalize the cost of the products of a room where practically the entire operation is by machinery as against a department where the entire operation is by hand.

The method we employ, which has proved satisfactory, is to divide the product of the factory into different classes, such as hard candy, hand dipped chocolates, machine dipped chocolates, moulded bars, etc., and to divide the overhead of these departments by the poundage of production, thus arriving at an overhead cost per pound.

How Figures Are Obtained

I shall now explain how the figures for the operating statements are obtained. The value of the materials charged to each plant or department is obtained from a summary of the charge slips which accompany all materials issued to the department, either from the warehouse or from some process manufacturing department. These summaries are arranged so as to show the quantities and value of each class of material charged out. The material accounts in the

factory ledger are sub-divided into columns for various classes of materials, as follows:—

Manufacturing materials, process materials, paper box materials, containers, miscellaneous operating materials, paper boxes and scrap material.

To the total of materials charged we add the inventory of goods in process at the beginning of the period. We deduct the inventory ending, which is a physical inventory of goods in process, and is taken at the end of each month. This is the only physical inventory we take, all other inventories being perpetual book inventories. The net result should be the materials actually used in the plant during the period under review.

We add direct wages, which are sub-divided in the operating ledger into the following:—Manufacturing wages piece work, manufacturing wages day work, packing wages piece work, packing wages day work. These sub-divisions of wages are kept for unit cost purposes to enable us to determine the cost per pound of labour on goods manufactured or packed by day work as distinctive from goods manufactured or packed by piece work.

The next item on the operating statement is packing cost. This is the operating cost of the finished stock room and includes the rental value of the space occupied and the cost of packing the goods into wooden boxes ready for shipment. As this department stores and packs the production of all departments of the candy plant, this packing cost is treated the same as overhead.

Factory overhead is the total power, refrigeration, warehouse expense, general expense, maintenance and repairs, and depreciation.

Power, which is sub-divided into motor power, cooking steam, fuel, light and heat, is the cost of operating the power plant. It is divided over the various operating departments on the basis of horsepower used.

Refrigeration is the cost of the air conditioning system installed in the plant.

Warehouse expense, which is divided up to show trucking, storage charges, etc., is the cost of the storing and handling of raw materials and the cost of trucking to and from the warehouses. This is divided over the various departments by percentage based on the materials used.

General expense is sub-divided into salaries, workmen's compensation, taxes, insurance, rentals, etc.

Maintenance and repairs is sub-divided in the ledger into buildings, machinery and equipment, as is also depreciation.

Depreciation

We distribute depreciation directly to the various operating accounts. Many accountants do not favour this method. They consider that depreciation should be treated in the same way as bond interest and shown on the profit and loss statement as a separate item. We treat depreciation the same as any other item of costs, by charging the department direct, and consequently the cost of the goods from each department includes the cost of depreciation. In this way we obtain the actual factory cost.

The total of materials, wages, packing cost and overhead is the manufacturing cost of the department.

The next item on the operating statement is production.

The figures for the production of finished stock and process stores are obtained by pricing the quantity of each separate line of goods produced in each department by the factory cost for the line as already determined from the unit cost sheets. In theory, the total value of the production as shown on each operating statement should exactly equal the total manufacturing cost of the department, provided the unit cost prices of the various lines produced by the department, as shown by the unit cost sheets, could be accurately computed. You will realize that this is physically impossible and that there will always be some difference between these two figures. This difference is shown under the heading of manufacturing surplus or deficit. It is possible, however, by the careful budgeting of the various items of cost to reduce this manufacturing surplus or deficit to a minimum.

We divide our inventories into the following main headings:—

1—Stores and Supplies.
2—Finished Stock.
3—Goods in Process.

Stores and Supplies

Under Stores and Supplies we have the following separate inventories:—

Manufacturing materials. These are raw materials used in the manufacture of confectionery.

Process Materials in Stores. This represents the inventory of such items as cocoa bean nibs, liquor chocolate finished chocolate coatings, shredded cocoanut, and any other process material which ordinarily would be purchased by a confectionery plant.

It was not feasible for cost purposes to show these materials either as raw materials or as goods in process. We, therefore, hit upon the idea of opening a separate inventory for finished coatings and similar process materials, and we call this "Inventory of Process Materials in Stores."

Paper Box Materials. These represent manufacturing materials used by the paper box factory in the manufacture of paper boxes. This inventory also includes cardboard, cellophane, labels, inserts and various other paper products used in the packing of confectionery.

Containers' inventory. For barrels, pails, both wooden and tin, wooden boxes and various other types of containers which are not paper boxes.

Miscellaneous Operating Materials. Materials used by the service departments. These include hardware, lumber, electrical supplies, paints and oils, gasoline, etc.

The operating statement shows the production value of each department divided into finished stock and process stores. These totals are a credit to the production account in the operating ledger and a debit to the production column of the inventory to which they belong. For this reason, the total of the production column in the inventory accounts must at all times equal the total production as shown on the operating statements.

I have already mentioned the fact that the only physical inventories we take are the goods in process of the various manufacturing departments. We keep perpetual book inventories for stores and finished stocks. These perpetual inventories are continually being checked up with the goods in stock and any differences are corrected as soon as found. As auditors, you will appreciate the value of this system in connection with the closing of the books at the end of the year.

Inventory Control Accounts

The inventory control accounts in the general ledger are subdivided into columns as follows:—

We start out with the inventory beginning, we add adjustments, if any, also factory production, purchases and departmental transfers, giving a total from which we deduct the consumption (in the case of stores), the cost of sales (in the case of the finished stock), and departmental transfer credits, and arrive at a book inventory for the end of the period.

The cost of sales each month is determined from the finished stock perpetual inventory record. This inventory record is a record of quantities, and each line of goods is shown separately. The production and shipments of each line is recorded daily and totalled for the month. To the quantity on hand at the first of the month is added the production for the month, the shipments are deducted, the result being the quantity of each line on hand at the end of the month. These quantities are then priced at factory cost from the finished stock cost price list, which gives us the total inventory value of finished stock. The difference between this figure and the balance of the inventory control account in the general ledger is the cost of sales.

We prepare each month a balance sheet and profit and loss account, with supporting schedules, including operating statements of the various departments.

Before closing my remarks I would like to give you some results which can be obtained from the operation of a practical up-to-date accounting and cost system.

The preparation of accurate operating statements will disclose which departments of the business, if any, are operating at a loss. A careful study of conditions as disclosed by these statements will enable the management to decide what can be done to correct such a situation.

By analyzing the figures shown on the various operating statements, to accurately apply this information to the unit cost sheets and to find out which lines, if any, are not profitable and to correct these conditions.

By using operating statements as a check on the operations in the various departments, to reduce operating costs by eliminating wastage. In some cases the operating statements will show the need for more modern machinery and improved operating conditions.

A system such as I have outlined, if properly installed, should give the management valuable and accurate information quickly and efficiently, and at no higher cost for clerical staff than under an antiquated system, which probably gave very little information of any value.

The Natural Business Year

By JOHN E. WILSON, C.P.A.
Asheville, N.C.

(Before the North Carolina Association of Certified Public Accountants, Charlotte, N.C., Oct. 19, 1928)

Reprinted from the "Certified Public Accountant."

THE subject assigned to me for discussion is one that has drawn the interest of business executives, chambers of commerce, educational institutions and professional accountants. Many able men have studied the subject and many articles have been written. Perhaps it should have been considered by the North Carolina Association of Certified Public Accountants, and acted upon, before the present time. The subject is entitled "The Natural Business Year."

It is one of national as well as of local interest. It seems appropriate at this point to define its meaning. I submit a definition which I believe was composed by Mr. Homar Pace of New York City, and which is as follows:

"The natural business year is a twelve-month period (or it may be a thirteen-month period if the calendar is revised) which ends at a time when a given business is in its most liquid condition; when trade or manufacture is at its lowest ebb and the inventory is small; when the receivables are low; when the results of a year's operation may be determined most accurately and with least inconvenience; when the truest financial picture of a business may be had; when plans and budgets for a coming year may be made most intelligently; when comparisons with other similar periods may be made most effectively. A natural business year is a fiscal year period. In some instances it coincides with the calendar year. In 60 per cent. of the cases, investigation shows that it does not."

It is evident from the definition as composed by Mr. Pace that he conceived the subject in a very broad sense, and that he had already given it considerable thought. In his definition he alludes to the revised calendar, which subject is likewise absorbing much interest at present.

It is my purpose to recommend that the North Carolina Association of Certified Public Accountants go on record as approving the natural business year. I wish to recommend now that this association consider the advisability of adopting the revised calendar. Its advantages, from an accounting standpoint, appear to be worthy of sympathetic consideration, and I will endeavour to give a brief outline of the proposal.

The plan which seems to be most generally approved is: that each month of the year shall contain twenty-eight days; that there shall be thirteen months in the year; and that the additional month to be

known as Sol would follow June. This would account for 364 days, and while there are 365 days in the ordinary year, the one extra day would be known as Year Day and would immediately precede the first day of January. An extra day would occur in the case of Leap Years. This would be placed between the months of June and Sol.

In the discussion of the subject of "The Natural Business Year," I shall endeavour to set out the advantages and disadvantages, both from the standpoint of the business man, and that of the practising accountant. Among the advantages are:

The taking of inventories at a time of quiet business, or when stocks are low. All of us will readily appreciate this advantage because, in the first place, inventory taking is a very difficult matter in some lines of business. The counting of the merchandise is a task in itself, but the placing of proper values thereon is much more difficult. Let us suppose that a merchant counts his stocks and attempts to price them at a time when he is over-supplied. Let us also suppose that this is done at a time when the supply exceeds the demand for his commodities. There is an adage "Hope springs eternal in the human breast." Hope may enter into his idea of the value of his inventory. He hopes to be able to dispose of his merchandise on the basis of the market on which he bought. This hope is likely to influence his opinion as to the prices placed against the several items on his inventory sheets. Many men are unwilling to acknowledge a loss in inventory under such conditions as I have mentioned. First, it is a reflection on the judgment of the buyer, and second, it is a failure to properly foresee market conditions. If the same merchant were to take his inventory at a time when stocks were low and find himself with good salable merchandise, even though the demand were somewhat light, he would be more favourably inclined to accept conservative values. It is obvious that the accountant would participate in the benefits. The labour involved in the verification of the inventory is lessened. The responsibility for the valuation, while divided, rests more easily, if conservatively stated.

Most of us know that the majority of merchants operate on a fiscal period, which ends with the calendar year. A goodly per cent. of these merchants are accustomed to trade in merchandise which is salable at Christmas time. They make elaborate preparation for this holiday business and sometimes for weeks in advance the sales are highly stimulated. The employees are overworked and exhausted when the closing hour at Christmas Eve arrives. The stocks, in many cases, are demoralized and when the stores close for the Christmas holidays, conditions are not really favourable for staging the pre-inventory sale which is usually attempted to clear the stocks by the first of January. As a matter of fact, the ordinary department store would find it more convenient to close its fiscal year at the end of January, rather than at the end of December.

The closing of the year at a time when receivables are low also inures to the business man as well as the accountant. The valuing of accounts receivables is difficult in many instances. We will suppose that a list of the accounts has been taken from the customers' ledger. The balances have been verified by direct correspondence with the

debtor. We have examined the ledger and have ascertained the promptness with which the various customers have been paying their accounts. We find some of these accounts are past due and payments have not been regularly made. The proprietor of the business is consulted. In some cases we may make a recommendation that certain accounts be either written off as worthless, or that a reserve be set aside to take care of possible losses. We are informed that these accounts are perfectly good and collectible. When these conditions confront an accountant at a time when the receivables are high the problem is more complex than when they are low. The fluctuations in the values of accounts receivables are sometimes pronounced, depending on existing conditions. If business conditions, generally, are improving there is a better prospect for collections than if conditions are declining. Hope, likewise, enters into the valuation of accounts receivables.

To close the year when payables are low is also advisable. There are difficulties in connection with valuing inventories; likewise there are difficulties in valuing receivables, but the ascertaining of a firm's indebtedness is sometimes almost impossible. If the year closes at a time when buying departments are active, there is likely to be much goods in transit. It is also probable that there are outstanding contracts for goods neither billed nor received. These contracts alone may actually spell disaster. I know of a firm which in the year 1920 closed its books on June 30th. The profit for the fiscal year was measured by many thousands of dollars. This concern at that date had outstanding contracts for large quantities of two commodities. By December 31st of that year the company had suffered a loss equal to all of the profits which were shown on the books at June 30th, and about 50 per cent. more.

To summarize the benefits to be derived from adopting a natural business year which would end at a time of low inventories, low receivables and low payables, it is clear that the natural cycle of business would have been completed. The inventory has been converted into good accounts, these have been collected and the liabilities extinguished. At a period when this cycle has completed itself, there arrives the opportunity of producing a more correct and a more conservative statement of conditions. The profit and loss would more nearly reflect the true results from operations. Incorrect inventories affect gross profit on the merchandise sales; over-valuation of accounts receivable affect the profit and loss statement, and the under-statement of payables affects both.

There are other advantages to be derived from the use of the natural business year. A correct basis for the formation of budgets; the collection of statistical data for a natural rather than an artificial period; more accurate cost finding; equitable income taxation; intelligent comparisons for managerial purpose, and a more logical determination of dividends distribution.

There is an advantage accruing to accountants in particular—the opportunity to build permanent all-year staffs. All of us know that at the beginning of each calendar year it becomes necessary to employ additional men. We endeavour to employ good accountants—some

are. If the work in an accounting office could be evenly distributed throughout the year, the profession would attract even more desirable men than at present. A young man would be induced to enter the profession, because he could obtain regular employment throughout the year. Incompetent accountants would be at a disadvantage, and efficient men would be more the rule.

There is a benefit which would accrue to both the state and federal governments, it seems to me. The collection of taxes would be more evenly distributed and more ease would be experienced in the auditing of returns, which would be received at regular intervals throughout the year.

Before passing to the disadvantages attendant on adopting a natural business year, I will state what, in my opinion, is the reason which causes firms to close their books at the end of the calendar year. In 1909 Congress of the United States attempted to pass an income tax law. This form of taxation was contrary to the provisions of the federal constitution at that time. In consequence of this, the law was declared unconstitutional. One of the provisions in this law was that reports should be filed at the end of the calendar year. In 1913 the first constitutional income tax law took effect. This law, as did all subsequent ones, permitted the use of a fiscal year which did not coincides with the calendar year. During the war period and until 1921 there was what was known as the "excess profit tax." The calculation of this tax presented many difficulties and because of these difficulties, many firms who were then starting businesses thought it advisable to have their closing date coincide with the calendar year. All of the new tax laws as they came into effect provided for the application of the new tax rates as at January first, each year. The tax laws have been conducive to the adoption of the calendar year rather than the natural one.

In my opinion there are no real disadvantages attending the adoption of the natural business year. There are, however, in some cases, what appear to be objections. There is a general belief that income tax returns are required to be filed on a calendar year basis. It is also thought that since the rates of income tax change with the calendar year, there might be some difficulty in making computations. Any change requires some effort and of course this rule applies here. There is one objection which is worthy of consideration, and that is, that comparisons and statistical information will be somewhat disturbed during the first year of the change. The belief has also been advanced that there might result confusion to the federal and state governments in estimating tax receipts. This seems unlikely.

I have endeavoured to show that the advantages to be derived from the general adoption of a natural year, whether or not it is coincident with the calendar year, far exceed the disadvantages.

This subject was very thoroughly investigated by the Bureau of Business Research of the College of Commerce and Business Administration of the University of Illinois. Inquiries were made and reports received from 439 firms. Of these 316 were using the calendar year. It was found that the natural year of these same firms ended with some month other than December, with the exception of 194 out of 439 firms. The general conclusions reached after this investigation

were that the natural business year does not necessarily end at the close of a rush season but just before the beginning of a new one, and that it was advantageous to close the year at a time when the financial statement would reflect low inventories and low receivables.

I am impressed with the belief that the closing of a year should be when outstanding purchase contracts have, for the most part, been completed; raw materials have been turned into merchandise; merchandise disposed of to customers; good accounts have been collected, and liabilities liquidated. A financial statement, prepared under these circumstances, would reflect a more correct condition, a more accurate history of the year's transactions, and a safer basis for the preparation of plans for the future.

Plant Engineering and Its Relation to Production, Time Studies and Costs

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IN my early days of engineering I ran across a story which, if I remember correctly, was as follows: "A western town in the States was quite excited over some wolves that became bold enough to come out of the bush and cause havoc by killing off pet dogs and causing disturbance in general. The civic fathers got busy and placarded the town, offering $25.00 reward to anyone killing these wolves. Wolves was on everybody's mind—not forgetting the $25.00. A local merchant, after indulging in too much red eye or moonshine, decided he would go to his wholesaler and have it out regarding an invoice he received which, to him, appeared exorbitant. He went to the manager's office and insisted on an itemized account as to how the wholesaler arrived at his figure. The manager in turn called in his cost accountant, who explained some of the items as overhead, fixed charges, interest, etc. The merchant understood the accountant to call him an 'ovalhead' and, under the influence of liquor, got into a shuffle and accidentally killed the cost accountant. Panic stricken the merchant ran to the street and on meeting a policeman said, 'I killed the cost accountant.' The policeman having wolf on the brain and knowing the wolf to be called by almost any vile name, said, 'Fine, my good man. Go to the station and collect your $25.00 bounty.'"

Well, that's just the way I felt about Cost Accountants. They should pay a bounty for them—because, after figuring out an engineering problem and arriving at some sort of cost, and finally having your appropriation approved, along comes the Cost Accountant and

upsets everything with old man overhead, fixed charges, depreciation, in fact he'd put in everything but the kitchen sink.

But my opinion of the accountant has been changed in due time. When J. P. Morgan, financier, addressed a gathering of engineers in New York (of which I am a member), and came out boldly criticizing us as being a failure in finance. He pointed out that we were cautious in figuring the strength of materials for bridges, buildings and machinery of every description, and after all our calculations we would tack on anything from 5 to 50% for a load or safety factor, but generally overlooking cost, depreciation, fixed charges, etc. At that time, which was 1918, I was connected with the efficiency department of a large automobile concern in New York. Our main ambition was designing equipment to eliminate the human element. We developed some machines that were almost human; in fact, did most every operation that a man could do with greater accuracy, but best of all, to our way of thinking, the machine was not on the payroll. Occasionally this statement of Mr. J. P. Morgan began to worry me, and I decided to check him up. So I picked out a small machine that was developed to eliminate one man at $4.50 a day. After investigating the depreciation, upkeep and running expense, I was amazed to find that this particular machine was on our payroll at $1.50 per day more with no increase in production than the labourer whom we were trying to eliminate; so I came to the conclusion that from an engineering standpoint this particular machine was a wonder, but from a cost standpoint it was certainly a failure. This naturally convinced me that J. P. Morgan was correct.

From then on the cost department was a necessity; and I soon forgot about the wolf and the $25.00 bounty.

Relation to Production

The relation of plant engineering to production in itself is a simple problem—design equipment that will efficiently and economically produce the merchandise and then keep the equipment operating during production hours without interruption. Our slogan is "Don't hold up production." Interruptions through faulty equipment are very costly. There are some concerns that pay their plant engineering staff a flat salary and bonus, deductions being made on bonus if interruptions occur. The engineering is not finished in its part toward production after the initial design of equipment, but by co-operating with the cost department, is charged with the responsibility of constantly studying the expensive operations and causes for variable costs on jobs as they occur with the view of changing either design, tool equipment or materials and effecting cost reductions.

Time does not permit me to go into detail to explain all the various means of reducing costs through plant engineering. I have picked out three specific cases of cost reduction accomplished in our own organization as follows:—

We had a peculiar problem when Duco came into use. The operators did not take very kindly to this new form of painting and were inclined to discourage the management in the use of same. After spending some time in plants across the line, who were already using

Duco in production, we revamped the entire paint department, using conveyors on body painting operations, including the polishing and striping. When this equipment was ready the storm broke. We were threatened with labour trouble. The management became uneasy and put the problem directly up to me to sell the men this new equipment. May I state at this point that at times it is very trying to convince labour that modern equipment is not developed to reduce their earnings. It requires diplomacy and tact, and lots of it, too, to convince him that with his honest efforts modern equipment will materially increase his earnings with less fatigue and at the same time decrease costs. This painting equipment increased his earnings 4.5% and decreased the unit labour cost 45.7%.

Another cost reduction was made in our enamel plant; but in this case the human element did not enter into it. The processing of enameling fenders and sheet metal parts requires 375 to 450° Fahrenheit; and originally this temperature was obtained through electric heating elements. On making a survey of various oil-burning equipments, we finally installed a system at a cost of $6,932.00. Our saving took effect immediately, as our electric power contract expired when oil equipment was complete. Our direct saving was $12,600 the first year, which paid for the equipment with a balance of $5,660.00 in reserve.

Another instance was a material in process handling proposition where, after the chassis became mobile, that is, wheels assembled to the frame, it was customary for the operator to manually push the chassis forward to the next zone of operators. This pushing operation was part of the piece-work price, and with our production was considered the logical way to do this; but on making a study of the situation we found that we were paying semi-skilled workmen to perform this laborious work at the cost of 28c per car. Now this seems ridiculous, but consider a man laying down his tools, pushing a car, going back to his own zone, again picking up his tools, repeating these movements for every car. This naturally fatigued the operator long before quitting time. Again applying a conveyor, which, by the way, is rather unique, being built flush with the floor and is, in reality, a moving floor for 290 ft.

The cost of this equipment installed was $9,650.00. The laborious work of pushing cars was abolished plus, now get this, 37.7% decrease in cost per unit and 3.3% increase in earnings per operator. Production was increased 22.5%. This increase, of course, was due to sales. This proposition, by the way, was the toughest one to sell to the management because, at first glance, the old system seemed the only logical way to economically perform this operation in a plant of our size.

I could go on for hours enumerating various ways through plant engineering where cost reductions can be effected.

Now, how do we know that a change in equipment will give us any savings? First, we must be on friendly terms with the cost department. This department to be of any help must be co-operative, efficient and accurate—one not burdened with so much detail that it cannot promptly have available information as to costs; and lastly and very important, a cost department in which the idea of service is

firmly fixed. Too often this department is inclined to assume an attitude of superiority and lose sight of its true purpose, which is to serve the operating departments. Fortunately I have the pleasure of being associated with an organization that is 100% co-operative. This includes my worthy friend Mr. Carruthers.

Time Study

Then there is time study. Time study is as closely allied to plant engineering as the instalment collector is to pay day—very close. At this point may I quote Mr. Herbert Hoover, who is known to be an authority on economics. Personally I have gained much through Hoover's works. During a survey he made in 1926 he claimed the average American factory to be inefficient. He states that loss and waste averaged 28% and ran as high as 56%. He found that in the average shop setting of prices was left up to the foreman. These men, however capable otherwise, are not qualified to perform this work. They can perhaps make as good a guess as anyone, but price-setting is no place for guess-work. In one of the large, modern shops of America he found prices which had been set by the foreman, and had been effective for years, were in the great majority of cases entirely too high. In one department there were 286 jobs which should have been 40% lower in cost. The workmen could have produced 2½ times what they were producing.

Now just such cases as Mr. Hoover mentions proves the necessity of time study on price setting. A time study man is not one of ordinary faculties. He must have imagination and ingenuity in devising new methods. He must have tact; be diplomatic, courteous, and have a strong sense of fair play.

Contrary to the average layman's belief, time study is not only a question of price setting, but is also an adequate and suitable means for determining cutting speeds and feeds to be used on machines; calculating speeds of processing equipment; in fact, necessary in all calculations where time is the element.

Let us at this time interrupt this talk for a few minutes; and with the assistance of the motion picture take a trip through the plant of Durant Motors at Leaside. This picture, although primarily used in sales promotion work, will give you a good conception of some of the labour saving equipment I have just described.

In conclusion, high speed production, business economics and keen competition are the problems always confronting the plant engineer, keeping him ever on the alert to cut down time of production, which in turn means costs. And through production requirements, time study and cost records we build the foundation of equipment, be it a simple hand tool or a large machine we know how far we may go towards expense and what our returns will be before the equipment is actually planned on the drawing board.

I want to thank you for the attention you have given me, and assure you it has been a privilege to give you this short talk. If any of you are interested in the equipment I have discussed or what you have seen on the screen and would like any further details, I will gladly given you any data I have.